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FISHERY PRODUCTS AND THE CONSUMER IN DEVELOPING COUNTRIES

Report of the

FAO/NORAD ROUND TABLE DISCUSSION ON FISHERY PRODUCTS AND THE CONSUMER IN DEVELOPING COUNTRIES

Frazer's Hill, Malaysia, 11-16 January 1982

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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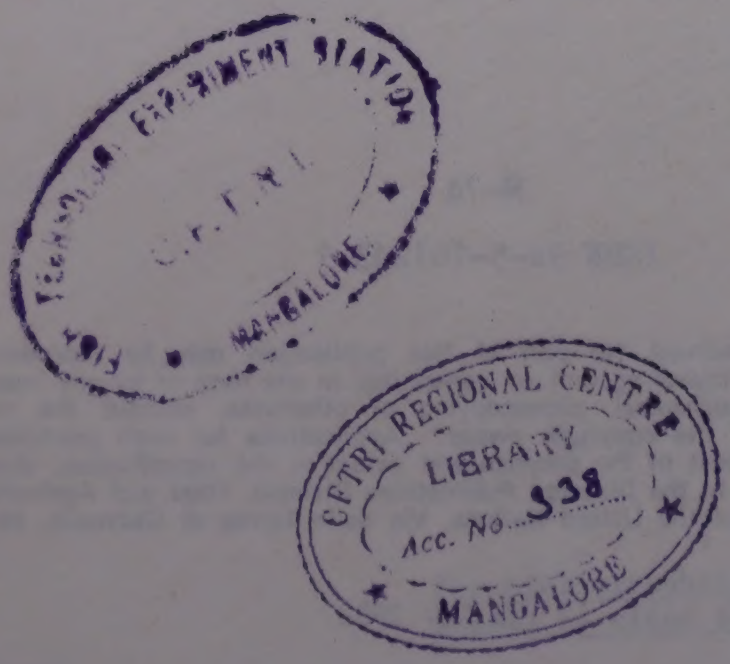

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ABSTRACT

The report summarises the discussions at the FAO/NORAD Round Table on Fishery Products and the Consumer held in Frazer's Hill, Malaysia, 11-16 January 1982. The nutritional value of fish is well recognised but a coordinated strategy is required to make products derived from fish available to low-income consumers. Many product development efforts have failed because proper attention was not paid to acceptability testing and market research. For commercial success potential consumers should like the product and have sufficient purchasing power to buy it. The report discusses increasing the availability of fish products to poor consumers via food aid, social (or subsidised) marketing and through commercial marketing channels. A strategy for development and marketing of fishery products is elaborated with the recognition that the ideas contained require fundamental policy changes in order to convert them into action.

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I. INTRODUCTION

In 1975 a Round Table Discussion on Expanding the Utilization of Marine Resources for Human Consumption was held at Svanøy in Norway. Discussion centred on how to make better use, for direct human consumption in developing countries, of those living marine resources which are either (i) underutilized, e.g., the 30 percent of world catches used for fish meal production, or, (ii) unexploited, e.g., the unconventional species (mesopelagic fish, krill and oceanic squids).

It was observed that while in the first case the harvesting technology was well known and in many cases the technology of processing had been worked out, in the second case neither the harvesting or processing technology was available. Projections of demand for fish and fishery products imply that all conventional resources must be brought into full production and that unconventional resources must also be exploited. The meeting in Svanøy identified a major gap between resources, either currently exploited or latent, and processed fish products. The participants concluded that in order to increase consumption of fish, as processed fish products, it was necessary to introduce low-cost processes compatible with traditional food preparations and habits. This was considered to be particularly important in low-income developing countries, both because lack of purchasing power and the prevalence of conservative food habits in these countries.

Since the 1975 meeting, work by FAO and national institutions has proceeded on some of the lines suggested, although on a restricted scale dictated by limited funding. A number of promising product approaches have been identified and some of them have been demonstrated and tested in various locations under varying conditions. In reviewing the accumulated experience, it became clear that there was a lack of understanding or communication between those engaged in product development of low-cost products and those charged with creating a market for them in low-income countries.

It was therefore decided to convene a multi-disciplinary meeting to discuss the problems and formulate a strategy for manufacturing and marketing fish products in developing countries. NORAD, who had funded the 1975 Svanøy meeting, agreed to fund the attendance of participants from developing countries at such a meeting, which was hosted by the Government of Malaysia, and held at the Merlin Hotel, Frazer's Hill, Malaysia, from 11 to 16 January 1982. The list of those attending, Appendix 1, shows the wide range of professional backgrounds, including technology, nutrition, economics, management, marketing, advertising and promotion.

The starting point for the discussions was that although the nutritional value of fish was well recognized, a coordinated strategy was required to make products derived from fish available to low-income consumers. Techniques of product development, acceptability testing and market research, to determine the size of potential markets are well advanced, particularly by large companies, but they are not entirely relevant when applied to low-income consumers, being designed for maximizing profit rather than the more altruistic objectives of food aid or community development. A simplified view is that two conditions have to be satisfied to ensure the commercial success of a product. Potential consumers should like the new product sufficiently to want to buy it and they should have sufficient purchasing power to do so. The first condition is reasonably easy to determine, but the second varies with the economic situation of the target group. For processed products, there are investment and energy costs, even for the cheapest products. In general these must be borne by the consumer. It is thus unrealistic to conduct market research among the poorest of the poor where no cash flow exists although nutritional demand is very high. Under these circumstances the costs must be covered from elsewhere, either by Government intervention or international assistance. Discussions on how public funds should be channelled to the poor consumer are beyond the scope of this report, as they touch on the social and political conditions of a country. However, there are many ways of ensuring more equitable food distribution and it is essential that this be done. The primary requirement is a focussing of political will to provide a climate for technical advances. The report concentrates on outlining a strategy for the development and marketing of fishery products, recognizing that the ideas cannot be converted into action without fundamental policy changes.

II. FISH IN NUTRITION

Annual production of fish was 72 million tons in 1980, of which 50.5 million tons, or 70 percent, was used for direct human consumption, the balance being converted to fish meal for animal feeding. It is estimated that demand will rise to about 107 million tons by the year 2000 as a result of income and population increases. Although the magnitude of the world's conventional fish resources has not been reliably determined, estimates of 100 million tons are generally considered to be reasonable. Thus, demand and availability could almost match in 2000 but any production increases over and above the 100 million ton level would have to come via stock enhancement or fish farming, or alternatively by tapping the unconventional resources, to which only orders of magnitude have been ascribed. Present and potential fish resources are shown in Table 1, Appendix II.

The apparent match between resources and demand does not take into account that all of what are loosely labelled "marine resources" must be turned into nutritious and attractive food products. Subsequently, these products must demonstrate their acceptability to consumers and gain profitable markets. Although almost all resources are nutritionally suitable for human consumption, there are technological problems of making conventional products out of many of them, for instance, the large bulk catches of small pelagic species used for production of fish meal and oil.

There is general scientific agreement on the excellent nutritional properties of fish, which in terms of protein quality is the equal of meat. Adequate nutrition requires a proportion of the high biological value protein such as that found in fish and meat to supply essential amino acids. However, many potential consumers, including enormous numbers from the developing world, are not aware of the value of fish as palatable food, even though fish is relatively more important than meat in providing high quality protein in developing countries. Table 2, Appendix II, shows the relative importance of fish in food supply compared with total animal protein. Although *per caput* consumption varies widely, there is only one developed country (Japan) in the first forty in a ranking order based on fish as a percentage of total animal protein supply.

The pattern of utilization of the portion of world fish production used for human consumption in 1980 as percentage of live weight equivalent was:

Fresh	29.3
Frozen	31.0
Cured	19.5
Canned	20.2

Meanwhile, 21.6 million tons (or 30 percent) is converted to fish meal; more than 50 percent of this is small pelagic fish. It is clear that the consumers' preference is for fresh fish, and for frozen fish which most approximates the fresh article. The balance is processed by drying or canning for the purposes of conservation.

Even if one adds a considerable proportion of fish meal catches and unexploited resources to the quantity currently available for human consumption, there is no opportunity to use fish to close the world's protein gap, but processed fishery products could make a more significant contribution to the diets of nutritionally vulnerable groups than at present. However, both technological and cultural considerations interfere. Too many product development efforts in the past have failed because these considerations were not appreciated and because the attributes of potentially successful products were not investigated first.

The demand for fishery products is determined largely by cultural history, that is, it is influenced by tastes acquired as children. Appendix 3 expands the considerations affecting attitudes to fish as food. Without active promotion, the demand tends to be inelastic as to price and income, but it may be opportune to question why fish does not play a more important role in nutrition. Many factors condition the diet of a family, and include:

- Socio-economic level
- Income
- Family size
- Availability of alternative food
- Food prices
- Educational level
- Food habits
- The "image" of food
- Individual preference
- Propaganda

Campaigns to promote the use of fish have been shown to be valuable from a nutritional and economic standpoint; however, such campaigns should study the above factors and ensure that they are incorporated. Although dietary habits must be considered, there are opportunities through feeding programmes and education to create a demand for fish among children. If such a demand can be sustained until they reach adulthood and acquire purchasing power, there are obvious market implications. Although promotion campaigns have stimulated demand, there are instances where supplies were not forthcoming to fill the demand, which then collapsed. In other cases the quality of fish or fishery products made available was too low, resulting in rejection.

III. ACCEPTABILITY TESTING

Many attempts at product development have foundered because of lack of proper introduction of the product and the testing of its acceptance by consumers. It is possible that disregarding these considerations has been a more significant reason for failure than product concept or economics. Unless a quantitative level of acceptability can be determined, there is no justification for planning expanded pilot plant operations, market development campaigns and commercial activities. Too often technologists working to develop products, ostensibly for developing countries, have not taken account of these considerations and have produced experimental products into a vacuum. They assume that there must be a market for a high-protein product and disregard both the economics of production and the acceptability criteria of the consumer. Viewing fish as a source of protein rather than an appetizing and nourishing food has distracted much effort from the goal of providing low-cost fish products. The history of the development of powdered products (FPC Type A and FPC Type B) is a good example of this.

The quantitative determination of acceptability is no guarantee of success but must be followed up by market research to determine the size of the potential market at prices determined by the physical inputs. If necessary, the production process must then be refined to reduce costs. The failure rate of new products is always high; some multinational food companies estimate that less than one percent of product suggestions are commercially successful.

There are no standard methods for the quantitative determination of acceptability of fish products by low-income groups and the difficulties are often compounded by illiteracy, requiring the presentation of very simple questionnaires and the provision of trained staff to record the responses. An analytical framework for the determination of acceptability has been developed in Thailand and is given in Appendix 4. This framework was used to evaluate the acceptability of two new dried fish products when substituted for the fish meat in traditional recipes. The respondents were 200 largely illiterate workers in a jute mill and 250 manual workers on the staff of Kasetsart University.

In Thailand there is a strong demand for fish which supplies the major part of the animal protein. People are reluctant to shift to other protein sources despite rising prices, caused principally by declining production of marine fish. The trawl fishery lands large quantities of by-catch consisting of small unattractive species of low commercial value. Because of the preference of the Thai people for fish, attempts are being made to use this by-catch for direct human consumption rather than fish meal. Acceptability tests were carried out with two products, FPC Type B and roller-dried fish, a more sophisticated product made by roller-drying a deboned mince. Quantitative indices, calculated according to the framework in Appendix 4, showed that both products were acceptable, but that the roller-dried product was preferred. However, the level of acceptability was responsive to price change and both products became "more acceptable" at lower prices.

In the initial tests, the FPC Type B and roller-dried fish were obtained from Norway and Denmark respectively. As a follow-up, these products have been produced in Thailand and will be re-tested with improved recipes, incorporating suggestions made by the participants in the first tests. Because there were indications that acceptability varied according to socio-economic characteristics, income levels and eating habits, additional recipes will be developed to test on the higher income market, in order to induce a demonstration effect for lower-income groups. At the same time avenues are being explored to introduce new fish products for low-income groups through institutional feeding programmes. Market research will be undertaken to determine the potential market volume before processing facilities are planned.

Another series of acceptability tests was reported from Somalia but, in this case, the respondents were not (traditional) fish eaters, in contrast to the Thais who esteem fish in their diet. In Somalia there is a severe shortage of locally produced food and the bulk of the supplies distributed to the refugee camps with an estimated population of 1.3 million is imported through food aid programmes. However, there are large under-utilized resources of sardine in the coastal waters. Although it had often been argued that Somalis would not eat fish, there was no evidence that this was true. A series of acceptability tests was conducted by FAO to determine the level of acceptability of sardine. The respondents were 200 refugee women taking part in a training course at the Women's Education Service, Mogadishu. The sardines were obtained frozen from Italy. In a survey to attitudes to fish taken before the tests, it appeared that, although many of the women had eaten canned sardines in the refugee camps, very few had consumed or even seen fish in other forms. The first test was administered by questionnaire after deep-fried sardine had been served two times for lunch. The second test was also done after a third lunch, but following a series of cooking demonstrations and lessons on the nutritional properties of fish. The questionnaire and the results, given in Appendix 5, show a level of acceptability rangingfrom 80 percent to 85 percent. These tests give strong indications, but no guaranteethat fish, if properly introduced, would be accepted by Somali refugees and by the population at large. It is hoped to initiate an introductory campaign through supplementary feeding centres, using dried fish until a distribution infrastructure can be built up.

The conclusions drawn from these two cases are that acceptability testing is a necessary prerequisite to introducing new products. Although both tests gave positive results, tests with FPC Type B in a number of other countries had been negative. Although the prospects of acceptability can often be inferred from food habits and cultural traditions, this is not always so and there is no substitute for a properly conducted test with a carefully prepared questionnaire.

IV. PROMOTIONAL STRATEGY

The development of a promotional strategy implies the availability of acceptable product and strong support from the Government if it is directed at the lower-income groups. Two examples of strong promotion programmes were presented and discussed at the meeting. In Mexico, the promotional campaign grew out of the Government's commitment to improve the nutritional status of the poor, through a programme called SAM (Sistema Alimentario Mexicano). It was reasonable to use fish as the high-quality protein component as greatly increased quantities of by-catch from shrimp trawlers have become available over the last five years. The campaign has made extensive use of commercial advertising techniques, including television and radio, because of the high coverage these media have in the country. The need for better nutrition and the excellent nutritional qualities of fish have been highlighted. Fish has been promoted as containing pure protein and the association between protein and health has been stressed.

Promotional strategies have focussed on changing consumer attitudes, on influencing the eating habits of children by relating fish consumption with success and general well being and on teaching housewives recipes for fish preparation. The campaign was directed mainly to women and children in urban and semi-rural areas who had the possibility to buy fish. Extension of the campaign to the countryside is planned for the future. In addition to fresh fish, the products heavily promoted were the cheaper packs of canned tuna and frozen fish-shaped patties prepared from cheap species and sold under the brand name "Pepepez". In some cases, profits from high-value packs have been used to subsidize the

lower-priced products. A great deal of general nutritional information has been incorporated, including an exhortation to pregnant and lactating mothers to increase their food consumption if possible. To date, the campaign has increased fish consumption from 3.6 kg to 9 kg *per caput* in five years at a cost of about US$ 6 million. It has also created a strong preference for fish among women.

In Guyana, a specially tailored low-cost promotional campaign has been run to create consumer demand for various fish products manufactured from the unfamiliar species found in by-catches from shrimp trawling. In addition to fresh and frozen fish, the products have included dry salted shark meat, fish sausage and smoked fish. In the campaign, recipes using these products were developed and the results presented at public tasting sessions. Nutritional education of the public was promoted via the media and by the active involvement of home economists in extension work. Special lunches and dinners were arranged to display the products of pilot-plant production using recipes developed in test kitchen and public demonstrations. In addition, the campaign involved participation in national and regional exhibitions.

Discussions on these two cases identified a number of situations in which promotional campaigns could be used. They, however, emphasized that these must be carefully planned to ensure, above other considerations, the availability of sufficient volume of resource as well as consistency in product supply. The sustained level and maintenance of the activity in general is important. The standard of the promotional campaign must be high. Government support and interest is of vital importance, particularly in those developing countries where production and consumption of fish has a low priority despite the confirmed presence locally of commercial resources.

Promotional campaigns can be valuable:

- when there is a need to change traditional eating habits in order to improve nutrition or for financial reasons (this may apply to specific consumer groups or whole nations);
- when there is a need to promote unfamiliar species of fish that can be harvested economically locally;
- when there is a general need to introduce new products or recipes in order to promote nutrition through increased utilization and consumption of fish.

Promotion campaigns can be of varied form and must usually be tailored to the country or the consumer group. Obvious vectors are television, radio, posters and leaflets, together with physical inputs of food in school-feeding programmes and hospitals. Television has been found to be the most effective medium.

Another effective promotional idea is the "taste and see" for various types of consumer groups, school-feeding programmes and hospitals. Well in advance of the public promotional campaign there should be an intense programme of product testing, quality assessment, consumer acceptability and market evaluation of the products with special attention being paid to the traditional tastes, prejudices, beliefs and attitudes of the group identified to which the campaign will be directed.

V. FOOD AID, SOCIAL AND COMMERCIAL MARKETING

In the discussion session devoted to marketing, three potential channels for reaching the low-income consumer were identified. Which one to choose or, possibly, which two to combine, depends on the economic circumstances of the consumers, particularly purchasing power, and the social and political attitudes of the Government. The simplest system to envisage is a standard commercial marketing approach where a low-cost product that has been developed and shown to be acceptable, is introduced through existing market channels to a community which has sufficient buying power. Alternatively, it may be necessary to set up a new distribution system but success will always depend on acceptability and price competitiveness.

Where the purchasing power is lacking, intervention or outside assistance is required. It was decided to use the expression 'social marketing' to define a situation where a product is made available at less than the full cost of production. The creation of a social

marketing system is usually directed either to subsidize the producer or to subsidize the purchase of food by the consumer. In either case, cash inputs from government or international sources are required. The other possibility is government legislation to regulate the flow of product to a market or to fix prices. This is a complex area and any intervention must be carefully planned to ensure that there is either long-term government support, as a matter of national policy, or that after short-term intervention circumstances will change to enable successful commercial marketing to start.

In the absence of a cash economy, but in the face of nutritional need, the remaining option is food aid from national or international agencies. Under these circumstances, money is given to purchase food supplies or a country donates food which is surplus to its own needs. Food is then provided at no cost to the consumer. While envisaged mostly for short-term emergency assistance following catastrophes, the acute shortage of food in many areas of the world, coupled with abject poverty, has made humanitarian assistance over long periods vital to the survival of many disadvantaged communities.

In discussing these three approaches, most attention was given to social marketing and food aid, on the assumption that commercial marketing needed little outside assistance beyond encouragement of the private and public sectors to produce products that have been shown to be acceptable, and to undertake energetic marketing promotions to convince buyers that fish is good for them.

A. Social Marketing

Examples from the Philippines and Egypt were quoted in discussing social marketing. In general, the option of fixing prices to the fishermen in order to expand consumption was not favoured as it seldom resulted in lower prices to the consumer. A better orchestrated campaign, with government backing, to ensure a degree of price competitiveness often by indirect subsidy, was felt to be more promising as the examples from the Philippines and Egypt show. However, it was pointed out that there had been many failures of government-supported efforts in fish marketing.

In the Philippines, Government initiative has set up a network of retail markets, the Kadiwa scheme, which vary from small stalls to large shopping complexes. The scheme is operated jointly by the National Food Authority and a Government corporation, Food Terminal Incorporated. The Kadiwa scheme buys the raw materials of essential commodities such as rice, cooking oil, dried fish, etc., processes them if necessary, stores the products and then retails them through their own outlets at reasonable prices. The system has become enormously popular with consumers and has expanded rapidly. It is reported that the first response of the private sector to the appearance of a Kadiwa market is to reduce prices. The system achieves economies of scale by bulk buying and reducing mark-up of goods.

The Egyptian Fish Marketing Company (EFMC) was established in 1964 to ensure the supply of fish to the poorer consumers. The EFMC is a public sector company charged with the marketing of local and imported fish. Its infrastructure includes cold stores,handling stations, reefer trucks and retail outlets. Fish is a desirable food in Egypt for every sector of the community and the Government has pledged to make it available at reasonable prices. Although the private sector is active in importing fish, the Government gives sufficient support to the EFMC, in terms of cost of foreign currency and relief of duty that the private sector rarely handles bulk imports, concentrating instead on high-value processed imports. The EFMC has now diversified into the retailing of fillets as well as traditional cooked fish products, using prepared meals for the institutional and retail sectors.

B. Fish in Food Aid

Fish has played a limited role in international food aid and, in fact, constitutes less than one percent of World Food Programme deliveries. There is no doubt that more fish could be used if the constraints of limited availability, taste and acceptability and the management of physical distribution can be overcome. At present, fish used in food aid programmes is largely provided by donors as products from their own countries. These products are often unfamiliar to the recipients and, in some cases, where high-value products such as canned fish are used, they may create a demand beyond the future purchasing power of the recipient. Although the careful selection of stable products with long

storage life from developed countries should continue, it would be easier to overcome the above constraints if production and storage were in developing countries close to those where food aid was required. This would not only provide recipients with familiar products, but would also provide an incentive to fish production in developing countries. More attention is required in both political and technical aspects. Politically the decision to change the present pattern of assistance must be taken but any decision to transfer production to developing countries implies technical responsibilities in identifying suitable products and ensuring adequate quality control. In addition, the infrastructure for production, storage and transport must be provided.

VI. PRODUCT CHARACTERISTICS AND PROCESSING METHODS

A large number of products have been produced experimentally in laboratories and some of these have reached pilot plant scale. However, progress to commercial scale operation has been disappointing; more success having been achieved with improving processing methods for traditional products. No attempt was made during discussion to list the various processes and products which had been tried but it was noted that they were mostly produced from whole fish or minced fish by drying, salting, fermentation and hydrolysis. In general, it was felt that products where integrity and texture were maintained had a better chance of success than powdered products but that much more research and product development was required for new products.

In general, development and marketing of non-traditional fish products is capital intensive and can thus only succeed where there are large underutilized resources and ready access to profitable markets (or high subsidies). Unless they are heavily supported, products from this source are unlikely to become available to the poorest sector of the community because of their high cost. This segment may therefore be better supplied by low-cost fish products produced at a village level by improved traditional technologies, and much can be done to improve the quality and reduce the cost of such products. Review of existing fish processing technology is required to see what modifications can be introduced to make cheaper products for local consumption; but the second step of training people at the village level to use the improved methods is even more important. For this effective extension services, backed by strong technological institutes, are required.

A number of suggestions for technological investigations that could be coupled with extension activities are given below:

(i) Find out and introduce means to reduce the spoilage and insect infestation during sun drying of fish, to avoid deterioration during cloudy periods, and to minimize losses during storage.

(ii) Develop technologies for handling and drying large volumes of small fish such as sardines, of which there may be periodic surpluses. At the same time, cheaper alternatives to the roller-drying process should be investigated to see if similar product characteristics can be obtained more cheaply.

(iii) Introduce ways of reducing the cost of canned fish, particularly by better control of raw material supply and price to increase yield. Investigate the prospect of national production of cans and alternative flexible packaging material for sterilized products.

(iv) Examine and improve methods of fermentation to improve quality and safety of fish products. The potential for combined fermentation of fish and plant material should be examined as it may be the best way to destroy harmful bacteria in the raw material.

(v) The extraction of liver oil and its distribution to combat the prevalent deficiency of vitamin A should be encouraged.

Despite the need for the investigation and extension efforts suggested above, it is clear that economic and political circumstances leaving large groups of people without purchasing power, are the primary obstacle to improving nutritional status, not lack of technology. However, there are opportunities to use existing technology to bring fish and fish products closer to the purchasing capacity of low income consumers.

VII. AN INTEGRATED STRATEGY FOR INCREASING CONSUMPTION OF FISHERY PRODUCTS IN DEVELOPING COUNTRIES

To conclude the Round Table Discussion, the participants prepared an integrated strategy for increasing consumption of fishery products in developing countries. The strategy has been designed as a multidisciplinary effort to include inputs from all the disciplines involved in product development, acceptability testing, market research, promotion, production and marketing. After examination of each activity in the strategy the mix of resource personnel for that activity can be identified.

The components of the strategy are the objectives; a set of activities designed to achieve these objectives; the implementation sequence of the activities, and the resource requirements needed to carry out the plan.

Objectives:

(i) To immediately improve the nutrition of socio-economically disadvantaged target groups in any given country by food aid programmes and social marketing (subsidy) schemes for as long as necessary.

(ii) To make maximum use of marine resources for human consumption by production and distribution of fishery products at the lowest possible cost.

(iii) To provide nutrition education to the nutritionally deficient target groups in particular and the population in general.

(iv) To improve the income and socio-economic well-being of the disadvantaged target groups by engaging in development projects not necessarily related to fisheries.

Activities:

Ten activities are proposed to achieve objectives (i), (ii), and (iii). Objective (i) is a short-term stop-gap approach and objective (iv) is not considered here since it need not be associated with a fisheries development programme. The sequence of activities is shown in Figure 1 - the description follows:

Activity 1 : Identify target groups

The target groups in relation to the objectives set out above are as follows:

	Target group
Objective (i)	The poor or nutritionally deficient.
Objective (ii)	The entire population.
Objective (iii)	The entire population with special emphasis on disadvantaged or vulnerable groups.

Activity 2 : Determine consumer and market characteristics

Unless information is already available the needs of the consumers as well as their attitudes and acceptances have to be determined. Household surveys, hotel, restaurant and institutional (HRI) sector surveys and consumer group discussions must be carried out to develop the information base.

Market potential, market share and market size must be determined. It should be recognized that fish is an alternative within the meat sector and hence the responsiveness of the demand for fish in relation to changes in the prices of other products is important. The market share of fish in the total market potential for "meat" must be estimated. Also, an estimate of the cash value of the market must be obtained. These estimates may be obtainable from trade and other statistics but consideration must be given to the groups outside the market (the poor) that are included in the objectives.

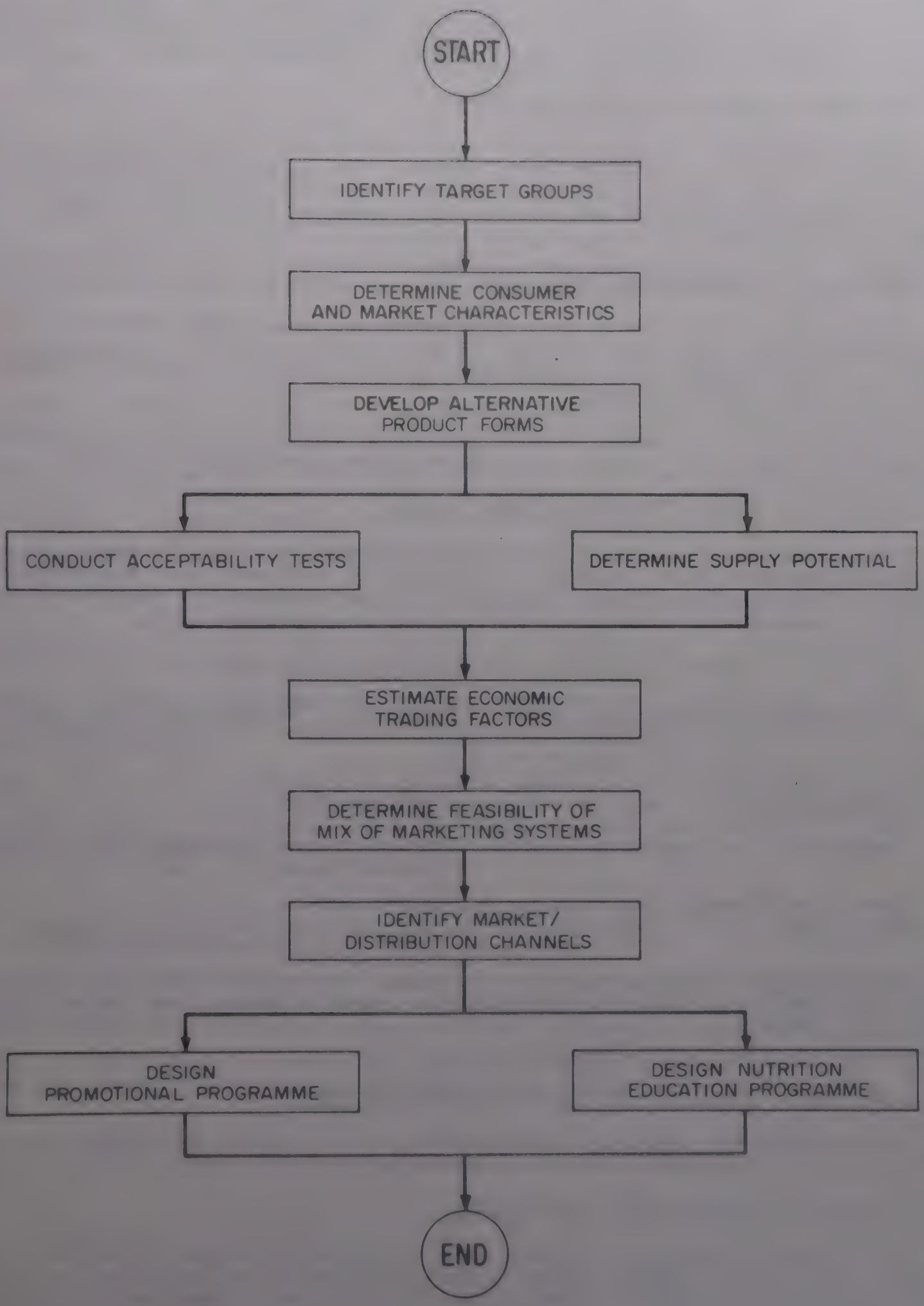

Fig. 1 Sequence of implementation activities

Activity 3 : Develop various product forms

The product forms to be developed will be conditioned by the consumer and market characteristics obtained in Activity 2 for the various target groups. Because of the dynamic environment it will be necessary to keep the consumer and market information under review and update it from time to time. Economic factors of production and distribution must be considered for each product form with a view to minimizing costs.

Activity 4 : Conduct acceptability tests

Careful selection of a representative sample and adequate pre-testing should enable a quantitative measure of acceptability to be made. The estimation of a valid index of acceptability is necessary to justify investment. Group meetings, discussions and sometimes social gatherings can be used to determine consumer acceptability of product form, packaging, price, etc.

Activity 5 : Determine supply potential

Simultaneously with Activity No.4, after having developed product forms consistent with consumer wants, the supply potential for each product form should be estimated to determine whether supplies would be sufficient to match the market size and the demands of the lower socio-economic groups.

An increase in supply should be encouraged whenever there is supply potential and any excess over demand for specific countries should be accumulated for food aid programmes.

Activity 6 : Estimate economic trading factors

When supply and market potential have been determined for several products found acceptable by consumers, it is important to obtain prices (wholesale, retail, border) and barriers to trade or distribution of the products. The examination of trade and pricing policies is necessary to determine the viability of the enterprise.

Activity 7 : Determine feasibility of mix of marketing systems

With technical and economic feasibility determined, the viability of the overall enterprise will depend on the collective marketing, operational and financial feasibility. The possible market systems considered would be:

Marketing system	Target group
Commercial	Those above a certain income level (having disposable income).
Social (subsidised)	Disadvantaged.
Food aid	Poorest of the poor and the vulnerable.

These systems should be combined and programmed simultaneously where appropriate, depending on the distribution and needs of target groups within a given country. For example, the combination of a commercial and social marketing system could have considerable advantages as compared with either system on its own.

Activity 8 : Identify marketing and distribution demands

The marketing and distribution channels will vary both within and between the different marketing systems and should therefore be carefully delineated to avoid confusion.

Activity 9 : Design promotional programme

A multi-thrust promotional programme must be developed to expose the various target groups to the product, whichever marketing system is chosen. The promotional campaign must work to acquaint the consumer with market channels, price and information about the product, including its form and how to use it.

Activity 10 : Design nutrition education programme

In all developing countries there are segments of the population with nutritional deficiencies. A sustained education programme must be developed to teach people to overcome these deficiencies, which are often a matter of ignorance as much as poverty. Nutrition education must be broad based but in situations where fish is available the high quality and nutritive value of fish protein, as well as its contribution to building healthy bodies, can be stressed. This education programme, which will require its own training programme, is in contrast to the promotional programme (Activity No. 9) which focusses on the benefits (and value) of specific product forms.

Resource requirements

In addition to guaranteed access to marine and freshwater fishery resources, human, physical and financial resources will be needed to implement the marketing strategy. The various resources required should be determined by examination of each activity. Having determined the human resources required, a multi-disciplinary implementation team should be assembled.

VIII. RECOMMENDATIONS

At the conclusion of the Round Table Discussion the group made the following recommendations:

- That FAO, other agencies in the UN System, and bilateral donors should consider the adoption of a strategy, such as the one discussed at the meeting, for increasing the consumption of fishery products in developing countries.
- Emphasis should be given to national and regional product research and development efforts which should make more use of expertise available in the developing world. Local consultant companies, universities and technological institutes should be encouraged to participate as experts from developing countries can be expected to empathize better with consumers, and it would be an advantage to have the consumers and consumer research activities close together.
- FAO should ensure that progress is evaluated to see what is being achieved and that opportunities are provided in the future for those active in such programmes to meet and discuss progress.
- FAO, the World Food Programme (WFP) and other agencies providing food aid are urged to take joint action to ensure that, where natural resources exist, fish products are made available as food aid both to provide immediate food supplementation for the needy and to contribute to the longer term community development by establishing economically viable fishing industries.
- Food aid and introduction of social marketing should be applied to improving local infrastructure, and the institutional system in developing countries should be given the capacity and responsibility to direct these efforts.
- Nutrition education should be incorporated into product promotion and consumer education campaigns as well as being an objective of both food aid and fishery development projects.
- The initiatives that have been taken should be encouraged and supported by the international system, particularly by monitoring and evaluation of projects.

APPENDIX I

FAO/NORAD Round Table Discussion on Fishery Products and the Consumer in Developing Countries

List of participants

Mr Adel Sayed Ahmed
Fisheries Development Consultant
Apt. 5 16 Road 257
Maadi
Cairo, Egypt

Ms Sei Poh Chen
Fishery Industry Officer (Quality Control)
Fish Utilization and Marketing Service
Fishery Industries Division
Food and Agriculture Organization of the United Nations
Via delle Terme di Caracalla
Rome 00100, Italy

Ms Candelaria Formacion
Assoc. Professor of Foods and Nutrition
University of the Philippines in the Visayas, Molo
Iloilo City, Philippines

Mr Ronald M. Gordon
Food Technologist
CARICOM Secretariat
P.O. Box 10827
Georgetown, Guyana

Ms Jamilah Haron
Director of Marketing
Fisheries Development Authority
7th Floor, Wisma PKNS
Jalan Raja Laut
Kuala Lumpur, Malaysia

Mr David James
Senior Fishery Industry Officer (Product Technology)
Fish Utilization and Marketing Service
Fishery Industries Division
Food and Agriculture Organization of the United Nations
Via delle Terme di Caracalla
Rome 00100, Italy

Dr Rudolf Kreuzer
Consultant
Cultural Aspects of Fish Consumption
Via Odoardo Beccari 28
Rome 00150, Italy

Dr Wolfgang Krone
Project Manager, INFOFISH
Market Intelligence and Advisory Service
P.O. Box 899
Kuala Lumpur, Malaysia

Ms Katarina Larsson
Adult Education Specialist
Parkgatan 8
112- 30 Stockholm, Sweden

Dr Alicia Lustre
Head, Food Research Department
Food Terminal Incorporated
FTI Post Office
Tagig, Metro Manila, Philippines

Ms Bina Rani Malakar
Deputy Director of Marketing
Fisheries Development Authority
7th Floor, Wisma PKNS
Jalan Raja Laut
Kuala Lumpur, Malaysia

Dr Theodore Panayotou
Visiting Professor of Resource Economics and Food Policy Specialist
Agricultural Development Council Inc.
Faculty of Economics and Business Administration
Kasetsart University
Bangken, Bangkok 9, Thailand

Ms Bulan Phitakpol
Senior Research Officer
Institute of Food Research and Product Development
Kasetsart University
P.O. Box 4-170
Bangkok 4, Thailand

Ms Rerngrudee Pruthiarenum
Fish Technology Development Division
Department of Fisheries
Ministry of Agriculture and Cooperatives
Rajadamnern Avenue
Bangkok, Thailand

Dr Jan Raa
Professor of Microbiology
Institute of Fisheries
University of Tromsø
Tromsø N-9001, Norway

Ms B.M. Rafful
Director of Advertising and Promotion
Secretariat of Fisheries
Alvaro Obregon 269-9
Mexico 7, DF , Mexico

Dr Basil Springer
Senior Consultant
SYSTEMS Group of Companies (Management Consulting, Training and Research)
P.O. Box 16B
Bridgetown, Barbados
West Indies

Dr Maria-Angelica Tagle
Nutritionist Consultant
UNO-WFP Regional Coordinator for Latin America
Clasificador 1215 - Corres 1
Santiago, Chile

APPENDIX 2

Table 1

Fish resources (million tons)

	Present (1980)					Potential (Additional)
	Food	Reduction	Not used	Total	Not landed	
CONVENTIONAL						
Freshwater	7.6			7.6		5 3/
MARINE						
Demersal	12.4	7.0	1.0	21.4	4-5 2/	15
Small pelagic	18.6	12.0		21.6		25
Others	2.1	+		3.1		2 4/
Crustaceans	2.7			2.7		0.7
Molluscs	2.6			2.6		5/
UNCONVENTIONAL						
Cephalopods	1.5	0.1	+	1.6		10-100
Mesopelagic	?	+	+			100+
Euphausids	+	0.4		0.4		50+
WORLD TOTAL 1/	50.5	20.5	1.0	72.0	4-5	

1/ Excluding seaweed, aquatic plants and residuals.

2/ Includes 3-4 million tons by-catch from shrimp fishery, and about one million tons of discards from demersal fishery.

3/ Increases from aquaculture, possibly up to 30 million tons, are not included.

4/ Smaller tunas, bonito, etc.

5/ Potential production depends on extent of culture.

Note: For the purpose of this Table, "Marine Fish" has been divided between demersal and pelagic (50/50).

Revised from: FAO
1975 Expanding Utilization of Marine Fishery Resources for Human Consumption, FAO,Fish.Rep. 175, p.6

APPENDIX 2

Table 2

Relative importance of fish in food supply (compared with total animal protein supply) 1/

Countries	Fish as % of total animal protein supply 1974-76	Fish as % of total protein supply 1974-76	Per Caput Consumption 1976 kg p.a. Fish	Meat
1. Sierra Leone	71.8	16.6	26.8	5.3
2. Korea Rep.	70.6	14.8	47.2	7.2
3. Korea Dem. Rep.	68.4	11.7	35.4	8.3
4. Ghana	65.9	20.2	27.6	9.4
5. Indonesia	63.6	8.3	10.4	3.4
6. The Congo	61.3	18.4	24.9	9.2
7. Bangladesh	58.9	7.9	10.8	3.4
8. Senegal	58.9	17.4	40.5	13.4
9. Philippines	58.2	22.6	33.1	15.7
10. Malawi	57.6	5.4	12.7	5.3
11. Viet Nam	56.3	14.0	21.8	13.1
12. Burma	55.3	7.5	13.6	6.2
13. Japan	55.2	27.9	64.1	24.9
14. Sri Lanka	54.7	8.4	10.9	2.7
15. Thailand	52.8	13.2	22.6	11.4
16. Yemen, People's Dem.Rep.	52.1	16.5	42.5	10.4
17. Ivory Coast	49.3	13.5	21.1	15.1
18. Kampuchea, Dem.	47.8	8.4	9.9	8.8
19. Malaysia	47.3	17.0	34.7	13.4
20. Togo	45.9	7.5	11.5	9.4
21. Liberia	43.2	9.9	20.8	10.4
22. Nigeria	40.3	5.8	11.0	8.4
23. Cameroon	38.0	6.4	10.4	12.7
24. Benin	37.9	6.9	11.2	11.7
25. Uganda	35.5	7.7	14.8	11.8
26. Chad	34.7	7.5	15.0	12.6
27. Singapore	31.6	15.2	42.4	47.4
28. Suriname	31.3	11.8	22.0	29.4
29. Hong Kong	31.2	18.1	50.5	72.3
30. Mauritius	29.9	9.1	15.7	11.1
31. Zaire	28.9	5.9	6.3	20.6
32. Zambia	28.9	6.2	12.3	15.8
33. Guyana	28.6	10.6	20.9	23.5
34. China, People's Rep.	28.3	5.9	5.9	21.2
35. Tanzania	27.2	7.5	15.4	12.9

1/ Josupeit, H. The Economic and Social Effects of the Fishing Industry, FAO Fish.Circ. 1981 314, Rev.1, pp.6-9.

APPENDIX 2 (continued)

Table 2

Countries	Fish as % of total animal protein supply 1974-76	Fish as % of total protein supply 1974-76	Per Caput Consumption 1976 kg p.a.	
			Fish	Meat
36. Burundi	26.8	1.9	4.9	5.3
37. Guinea	25.6	2.6	4.7	5.6
38. Mali	25.2	5.1	10.9	13.6
39. Angola	23.2	5.3	6.7	13.0
40. India	22.4	2.3	3.4	1.5
41. Spain	20.5	10.3	35.9	60.1
42. Iceland	20.0	15.7	70.0	34.9
43. Lao	19.4	3.3	6.2	17.4
44. Peru	19.4	6.6	17.2	24.4
45. Denmark	19.2	12.5	30.0	70.8
46. USSR	18.7	9.3	28.7	54.6
47. Cuba	17.5	8.6	20.4	35.7
48. Mauritania	17.5	8.5	20.9	25.7
49. Central African Republic	17.4	3.8	5.8	17.4
50. Madagascar	15.5	3.4	6.1	24.5
51. Norway	15.3	9.8	26.5	52.5
52. Sweden	14.4	9.5	32.3	62.7
53. Finland	13.8	8.9	26.1	57.9
54. Morocco	12.6	1.7	4.5	12.7
55. Poland	11.8	6.4	20.6	70.3
56. Trinidad and Tobago	11.7	4.9	10.1	33.6
57. Brazil	11.5	4.4	7.2	33.4
58. Chile	11.3	4.2	15.8	37.9
59. Venezuela	10.6	5.3	10.5	44.1
60. South Africa	10.4	3.8	7.3	39.1
61. Tunisia	10.3	2.2	5.3	19.4
62. Germany, Dem.Rep.	10.2	5.9	18.7	82.9
63. Greece	10.0	4.6	15.7	59.4
64. Ecuador	9.8	3.8	10.4	19.3
65. Dominican Republic	9.5	3.3	6.2	18.1
66. Egypt	9.5	1.4	4.4	13.1
67. Bulgaria	9.3	3.5	12.0	57.0
68. Mozambique	9.3	1.1	1.9	7.8
69. Libya	9.3	3.0	7.5	31.6
70. Italy	9.0	4.1	12.8	62.8
71. Yemen Arab Rep.	8.7	1.5	3.7	14.7
72. UK	8.6	5.2	17.8	73.0
73. Turkey	8.6	1.9	4.5	21.0
74. Saudi Arabia	8.1	2.3	5.3	23.5
75. Malta	7.9	3.8	13.3	56.7

APPENDIX 2 (continued)

Table 2

	Fish as % of total animal protein supply 1974-76	Fish as % of total protein supply 1974-76	Per Caput Consumption 1976 kg p.a.	
			Fish	Meat
76. France	7.8	5.0	22.2	91.9
77. The Netherlands	7.3	4.6	13.1	72.9
78. Belgium-Luxembourg	7.2	4.4	18.3	91.6
79. Germany, Fed. Rep.	7.1	4.5	10.9	84.1
80. Iraq	6.5	1.3	2.8	14.9
81. Algeria	6.4	1.2	2.3	9.0
82. Israel	6.3	3.3	11.1	65.2
83. Romania	6.3	2.4	5.7	55.2
84. Canada	6.2	4.0	18.2	101.3
85. Mexico	5.9	1.8	4.8	23.4
86. Lebanon	5.8	1.4	3.2	23.3
87. Jordan	5.5	1.2	2.1	10.8
88. Colombia	5.3	2.3	3.4	29.3
89. USA	5.3	3.5	15.4	114.3
90. Australia	5.2	3.5	14.6	116.3
91. Costa Rica	5.2	2.3	4.5	21.3
92. Kenya	5.0	1.1	2.8	18.7
93. Nicaragua	5.0	2.0	4.3	28.6
94. Ireland	4.8	2.9	14.2	90.9
95. Haiti	4.7	0.7	1.8	10.8
96. Switzerland	4.7	3.0	10.4	77.7
97. Cyprus	4.2	1.7	6.3	63.9
98. Czechoslovakia	4.1	2.4	7.9	85.3
99. Upper Volta	4.1	0.3	1.0	8.0
100. New Zealand	4.0	2.8	16.9	114.8
101. Rwanda	3.7	0.2	0.3	5.3
102. Austria	3.4	2.0	7.8	79.1
103. Yugoslavia	3.3	1.1	3.0	48.1
104. The Niger	3.2	0.5	0.8	12.7
105. El Salvador	3.1	0.9	2.1	12.7
106. Hungary	2.8	1.3	5.0	77.8
107. Albania	2.6	0.7	1.7	24.9
108. Bolivia	2.6	0.8	1.9	31.4
109. The Sudan	2.3	0.6	1.5	25.4
110. Uruguay	2.3	1.4	5.0	111.9

APPENDIX 2 (continued)

Table 2

	Fish as % of total animal protein supply 1974-76	Fish as % of total protein supply 1974-76	Per Caput Consumption 1976 kg p.a.	
			Fish	Meat
111. Syria	2.2	0.4	1.5	16.3
112. Argentina	2.1	1.4	4.0	115.4
113. Pakistan	1.9	0.5	1.4	9.1
114. Ethiopia	1.8	0.3	0.8	19.5
115. Guatemala	1.7	0.4	0.9	12.2
116. Honduras	1.5	0.4	1.1	12.6
117. Paraguay	1.1	0.4	1.0	62.8
118. Iran	0.7	0.1	0.5	19.5
119. Somalia	0.5	0.3	1.4	61.3

Sources: For the first and second column, unpublished data from AT 2000, FAO, Rome.
For the third and fourth column, Food Balance Sheets 1975-77, FAO, Rome.

APPENDIX 3
Factors Determining Attitudes Towards Fish in the Diet

by
Rudolph Kreuzer

I. INTRODUCTION

It is a paradox that while many millions of people are undernourished there are millions of tons of underutilized fish and shellfish. The technical and economic problems that prevent the use of this valuable protein as human food are serious but not insurmountable but the major stumbling block is acceptance by potential consumers. Man neither consumes animal protein in the form provided by nature nor does he consume it because of its beneficial properties; acceptance is conditioned by tradition and taste and these factors determine what is regarded as good food and how it should be prepared.

From the enormous variety of foods available, economics influence the amount consumers can buy, but what to eat at a certain time, i.e., what to select from the shelf or the display cabinet when shopping, is a decision influenced by factors deeply rooted in the consumer's cultural and social background. The choice is also determined by the occasion for which the purchase is being made, or by specific temporary needs, by curiosity, by belief, the influence of advertisements and by many other factors.

It is not long ago since the impact of these factors on man's nutrition and attitudes towards food was recognized. There is still a lack of detailed information on the origin, influence and ramifications of these factors, as well as their importance in society as regards attitudes towards food and peoples' willingness to modify diets or to accept changes.

This paper does not intend to give answers to particular questions in this respect but to identify some of the numerous factors and to disentangle them with regard to specific types of societies. It also draws attention to the importance of these factors for product development, fish marketing and the promotion of consumption particularly of products made from neglected fish species.

Although emphasis is on fish and shellfish and on peoples' attitude towards them as food, these commodities and the problems involved cannot be discussed in isolation. They need to be seen as part of peoples' entire dietary patterns and their food behaviour.

II. FACTORS DETERMINING CONSUMER ATTITUDES

The main determinants influencing consumer attitudes towards particular foods, including fish and shellfish, are as follows:

Availability
Acceptability/Avoidance
Economic Status

The particular importance of these determinants for the consumers' decision depends on:

Environment	(ecological factors)
Physical capacity	(physiological and psychological factors)
Culture	
Social pattern	
Economy	

A number of variables determine the importance which these groups of factors have in the process of decision-making with regard to food. In this paper the consumers' attitude is considered and the apparently important factors are discussed. For a hunter-gatherer society, where the producer is also the consumer, animals and plants of the environment which the society inhabits determine the diet and thus the attitude towards the food available. These ecological factors are most important. An affluent citizen usually has little interest in the origin of the fish she/he buys. Pollution of the environment was unknown to ancient hunter-gatherers, but to today's affluent city dweller, it can be an important factor in his choice of purchase.

Various variables of the main groups of factors are listed below. They influence the attitude of individual persons or societies towards food to a varying degree and in a variety of combinations.

Ecological Factors

- Animals
- Plants
- Climate
- Soil
- Water
- Topography

Physiological, Psychological Factors

- Age
- Sex
- Physiological Conditions
- Psychological Conditions and Influences
- Chemical Properties
- Sensory Characteristics

Socio-Cultural Factors

- Ethnic Background
- Cultural Patterns
- Social Patterns
- Religion
- Taboos
- Beliefs
- Temporary Dietary Restrictions
- Technology
- General Education/Nutrition Education

Economic Factors

- Income
- Price
- Markets
- Presentation/Packaging
- Product Promotion
- Advertisement

III. PRE-INDUSTRIAL SOCIETIES

Man's food, during the first two million years of his evolution, was primarily determined by his environment. He collected what appeared edible to him. Later, the development of his technological capabilities enabled man to invent tools and to use them in the quest for food. Hunting and fishing enlarged and changed his dietary patterns. Dependence on ecological factors, as determinants of food supply and food consumption made him vulnerable to changes of the environment. Furthermore, the way of life allowed limited cultural and social development through lack of incentive. Thus the narrowness of the way of life or the narrow range of determinants eventually decided future developments, in all climatic zones.

The end of the last Ice Age deprived the northern hunter-gatherers of their main food resources. At the same time, the changing climatic conditions in western Asia and the Near East favoured the evolution of animals and grass plants suitable for domestication. The animals could be herded and the grain seasonally harvested and the seeds stored. A new society, a settled peasantry, appeared. Cultivation of cereals and husbandry offered surplus food supply which could be stored after harvest. The settled peasants could more efficiently cope with the unpredictable natural forces of their environment.

Populations grew and the food needs could be produced by only a part of the workforce of the society. Division of labour with the emergence of "non-food producers", led to larger, fortified settlements, towns, and to urbanization. These settlements required

exchange of goods, including food, with neighbouring societies. The establishment of markets made the consumers to some extent independent of local agricultural production. As a result, the number of food items, available to town dwellers increased and people became accustomed to new foods. The town's peoples dietary patterns changed more substantially than that of the rural population: urban versus rural cuisine emerged.

Cultural life developed and sophisticated cultural patterns with complex societies evolved. This led to cultural and social factors becoming prominent in forming peoples way of life. Food habits were part of this way of life and foods had basic social functions in the societies (den Hartog, 1979).

Today, a number of societies in non-industrialized countries follow the traditional way of life, although practically all societies are in some way influenced by industrial products and the way of life prevailing in industrial countries. Many traditional customs linger on and need to be taken into account when changes in food habits are intended.

Social function of food

Many societies emphasize the social aspects of food and of the consumption of food. Sharing of food is in some societies higher valued than satiation of hunger with this food. Margaret Mead (1947) showed how seriously the Arapesh of New Guinea considered social sharing the primary function of procuring and eating food - and even of humanity. In their view "the lowest form of humanity is the man who eats his own kill, even one tiny bird". Mead, furthermore, writes: "the ideal distribution of food is for each person to eat food grown by another, eat game killed by another, eat pork from pigs that have been fed by people at .... a distance".

A great number of populations in the Pacific have a similar approach to food and eating. Slaughtering large animals for sacrifice on certain important social occasions and distributing the meat among all villagers or tribal members means sharing of rare and highly preferred food among all, and by this, the society ensures that the poor also get their share of rare and valuable foods.

On Namu, a small Pacific atoll, food is usually equally distributed among the members of a family. Certain cultural rules are important, however, when a highly desirable food such as fish, is available, perhaps once a week. The head of a large fish has to go to the oldest female in a sibling set, or may be reserved for a visitor (Pollock, 1973).

Social aspects influencing food behaviour can be observed practically in all societies. A full appreciation of the symbolic meaning and the specific value which a food may have for a society is considered essential when introducing fish products or other food items. It is important to realize that while an expert with his foreign cultural background is concerned to improve living conditions, the local people may fear the destruction of traditional values through his efforts.

Canned fish together with rice supplied as food rations to plantation workers has become status food in rural areas and in the highlands areas of Papua New Guinea. The food of the rich usually carried social prestige. Therefore, introducing products specifically prepared for the poor or just as a nutrient without social prestige is difficult or probably doomed to failure in most of the traditional societies.

Religiously motivated fish avoidance

Fish avoidance occurs in Hinduism, Buddhism and Jainism as a consequence of the belief in Ahimsa, the abstention from taking life which is one of the fundamental concepts of the religions. This concept has also influenced the food habits of millions of people through vegetarianism.

Hinduism is the religion of the vast majority of Indians, and Buddhism has spread over many countries of Asia, claiming the greatest number of adherents of all the major religions. Jainism has today only a small group of followers in India. The Jains, however,

adhere most vigorously to the concept of Ahimsa. The monks never eat fish and devout followers not even engage in the fish trade (Thomas, 1956) or in fishing (Simoons, 1974 a). In Hindusim, the observance of Ahimsa is related to the caste system which is inseparable from the religious concept. Members of the Brahmin caste and of certain other castes of high status avoid fish completely while members of lower castes do not adhere so strictly, to this custom. In highly populated Bengal with abundant fish resources even Brahmins depart from ideal Brahmin behaviour. (Simoons, 1974 a). In Bengal, fish is an indispensable food and the need for it was obviously stronger than Ahimsa. A similar exception was observed in Tibet, where Buddhism is the religion of the people. Simoons,(1974 a) quotes Harrer who visited Tibet in the early 1950's, as writing that despite the general Buddhist rejection, fishing is specifically permitted in a desert area of the Upper Brahmaputra region where there is nothing to eat except fish. Nevertheless these people are held in low esteem. In general the Dalai Lama had imposed restrictions on eating of fish, but by tradition fish eating was obviously common. It is still common among men although not among women and lamas.

In the Mongolian Peoples Republic the Government is promoting fishing and the consumption of fish. In Japan where both Buddhism and Shintoism are practised together, no general fish avoidance exists although many people adhere to a variety of restrictions. These are, however, practised only in families or villages. Buddhists in Sri Lanka take part in fishing activities and eat fish. In southeast Asia, Buddhism has not led to a general rejection of fish as food, although monks do not include fish in their diet.

According to Jewish religious rules, fish with fins and scale are permitted while shellfish and cartilageous fish are not. Moslems refrain from eating non-scaly fish. The Catholic Church restricts eating of meat but not fish.

The number of people avoiding fish as food for religious reasons is difficult to estimate, but it seems that in some countries perhaps a considerable fraction of the population avoid fish for religious reasons. Some idea can be obtained from India: the Marketing Report, 1951, quoted by Simoons, 1974a, mentions that "custom, religion and prejudice play a big part in determining the demand for fish." Panikar (1962) assumes that 68-73 percent of the total population of India eat fish, and the Marketing Report from 1946 states that 15-35 percent of the Hindu population of India avoid fish (Simoons, 1974a).

Superstition and mythical beliefs

The Kari people of Japan do not eat octopus as mythology relates that an ancient god was rescued by an octopus (Yudkin, 1979).

The two dolphin species living in the Amazon River are not eaten by fishermen because of a superstitious belief associated with a kind of symbiotic relationship which has been established between fishermen and the dolphins since the dolphins are believed to alert fishermen to the presence of fish schools or chase the fish into the nets (Smith, 1981). Beliefs in a kind of cooperation between fish and man are very old. The fish Phagros (Mugilidae) was sacred to the ancient inhabitants of Aswan (Upper Nile) because the migrating fish was believed to announce the coming of the flood, vital to Egypt.

Superstitious and magical beliefs influence a relatively small number of people and under the influence of education and modern information are gradually disappearing among the younger generation.

Totemic restrictions against eating fish

Tribes deriving their origin or name from a certain animal forbid the eating of these animals. For example, certain populations in Africa do, for such reasons, not eat catfish (Clarias spp.) or captaine (Lates niloticus) (de Garine, 1969).

Temporary restrictions - Remoso fish

Traditional societies attach great importance to the cycle of life and at points of stress in this cycle the members of the society, especially the vulnerable groups, need special attention. Nutrition, due to its general social function, plays a decisive part

in these protective measures. Pregnancy and childbirth are seen as periods of stress in the cycle of life and mother and child have to be protected from both the medical and the magic point of view.

Wilson (1973) studied the society of a fishing village on the east coast of Malaysia. In this village, many customary foods are forbidden for women during pregnancy and after childbirth. This is done in an attempt to balance "hot" and "cold" influences in accordance with the Galenic humoral system. Besides most fruits, all vegetables and fried food, many species of fish, considered toxic, are proscribed such as catfish, snapper, dorab, pomfret, ray, bonito and "foreign" fish. Wilson mentions that women of the village prefer to stay in their mother's home during this time undergoing the customary treatment from about the seventh month of pregnancy, although a modern clinic with all facilities is only a mile away. One of the reasons is reliance on folkmedicine, but it also appears that the custom is very deep rooted in the cultural tradition of the people.

In Vietnamese traditional societies, freshwater fish is among the prescribed foods while saltwater fish and shellfish are among the proscribed foods during pregnancy.

In Latin America, the property "cold" is attributed to foods from animals living in water, fish therefore are "cold", but shrimp are considered "hot" because they are always dried and salted for preservation. Salt is considered "hot" as it comes from dry ground.

"Remoso" is a concept widespread among peasants in the Brazilian Amazonas. Originally, it classified the "safety" of game and domestic animals for consumption, but about 27 fish species are also considered remoso. The properties making fish remoso are not known and different fishermen may consider different fish remoso. There is, however, a certain correlation between high fat content and remoso. Among the remoso fish are a number of catfish and there is an old aversion against this group of fish. The avoidance of remoso fish is not strictly adhered to, especially when meat is not available for the main meal.

The primary concept of remoso seems to be the protection of the health of the individual, and remoso appears to be based on Hippocratic medicine. One assumed quality of remoso fish is that they can thicken the blood and can exacerbate some health problems if eaten. Therefore, remoso fish is generally avoided by people who suffer from a wound, from measles, tumors, skin rashes or from venereal or liver diseases. Women after childbirth should not eat remoso fish (Smith, 1981). Smith also reports that, because of the belief in remoso, most of the production from catfish fisheries is exported.

Fish appropriate on certain occasions

Some foods are thought suitable for certain holidays or celebrations, for example, turkey on Thanksgiving Day. Fish are also used to celebrate feast days:

Carp for Christmas in Germany;

Large eel for Christmas in Italy;

Carp on Boy's Day (5 May) in Japan.

Nutritional concepts

In general, nutrition is a modern science and was not known in pre-industrial societies. Nevertheless, intake of food or avoidance of some food items under certain situations played a considerable part as mentioned above. Dietary rules were part of the health concepts, based on folkmedicine, magic and belief. Where great social change takes place, as with immigrants, successful trials to change attitudes towards food and eating habits are reported.

Cooking and meals

Societies have developed specific ways of cooking. Traditional cooking styles are influenced by the food available, the cooking facilities and the type of fuel as well as the herbs and spices nature provides.

A few examples may illustrate the different ways fish and shellfish are cooked and eaten. Along the Auracian coast of Chile, shellfish is either roasted, fried or stewed and eaten with tortillas and a type of sea algae. In Central America, boiling and frying are usually done in an open clay fire but, since cooking facilities are limited, the number of dishes which can be prepared for a meal is also limited. Fish are dried on a shelf over the fire place and are consumed in the coastal areas. In many West African countries fish is the main source of animal protein and is eaten when locally available. A traditional meal consists of a dish based on cereals or starchy roots which is eaten with a sauce. Fish is used in this sauce or is eaten in dried or smoked form. In Southeast Asia, rice is the primary staple. Fish and sea food products are the main source of animal protein. Salted and fermented fish products are common by reason of the need for preservation. In Indonesia, the lower class urban and rural people eat two meals a day, breakfast and evening meal. The latter consists usually of rice, often mixed with maize or starchy roots, a leafy vegetable side dish and a small piece of fish or meat in a sauce (Vermury, 1978).

Studies on changing eating habits of immigrants carried out in Israel and Canada have revealed that, in general, ethnic habits are maintained in the cooking style and in the use of herbs and condiments, i.e., the traditional flavour, while the dietary pattern is expanded to include the components of the typical urban pattern (Miller, 1977).

Introducing new food items and changing eating habits is possible, but the basic cultural factors determining a particular consumer's acceptance need to be known and to be maintained. In addition, physiological, economic and other factors need attention.

Price and income

Price of food and the cash income at the disposal of a family are important factors with respect to the acceptability of fish, in particular for urban wage earners who need to buy all their food. In traditional rural societies, however, other factors may be predominant. The Report on Marketing (1951), quoted by Simoons (1974a), mentions that the striking contrast in local consumption of fish in India depends not only on availability and cost but on food habits, including regional ethnic, religious and caste differences.

Campbell (1978) underlines that the price of food and the income level of the consumer determine the amount of food a family is able to consume. Dietary intake of nutrients was, in general , proportional to the expenditure levels and inversely related to family size. "Adequacy of dietary intake was also related to the type of community, geographical location, ethnic background and family eating habits".

The food eaten in rural Africa depends mainly on subsistence activities such as horticulture, nomadic herding, mixed agriculture, and to a lesser extent, on the income of the people. (Vermury, 1978).

The "Care" Report on rural food habits in developing countries lists as principle factors affecting food habits: (1) social influences; (2) household income and availability of food; (3) households ability to purchase, cook and store foods; (4) food beliefs; and (5) the life cycle of the individual (Vermury, 1981).

IV. INDUSTRIAL SOCIETIES (AFFLUENT)

Industrial and economic development gave rise to new societies with modern conveniences particular patterns of life and attitudes towards food. In these societies, which include the well-to-do middleclass, the new features occur in their most characteristic form. The low-income town's people and slum dwellers are not considered in this paper although their needs with regard to nutritional benefits deriving from fish are well recognized.

One characteristic feature of fully industrialized countries is that foods of almost all regions of the world are regularly available to the consumers. Shops and supermarkets offer easy accessibility to hygienic, well-packed and preserved foods, also perishable ones. Households are equipped with refrigerated storage facilities and cooking can be done with sophisticated equipment.

Social patterns have changed since pre-industrial times. The individual is largely independent in his behaviour and habits. He is free to choose his meal and to eat what he wants. Even children are free to choose what they want to eat. Thus, the parents have often little control over their childrens' choice of food. Eating out during the day is for many working people a necessity, and dining out in the evening is a pleasure or a social function. Cafeterias, restaurants and other establishments have a great influence on food habits and attitudes towards foods. Foods prepared by industries, ready to cook or ready to serve are another factor which strongly influences eating habits of the members of modern societies.

Due to these technical and social changes, the factors which influence consumers' attitudes towards food have also changed when compared with traditional societies. Acceptability and preference of the individual person became prominent in contrast to the strongly socially dominated food acceptance and food intake of pre-industrial societies.

Some of the important determining factors are discussed below, in their relation to acceptability.

Acceptability of fish by consumers

Acceptability of fish and fish products embraces, as in the case of all foods, a great variety of factors from the psychological conditioned taste to socially determined habits. The list of the most important factors determining modern consumers' choice may comprise:

(i) General attitude to fish and shellfish;
(ii) Availability;
(iii) Product form and presentation;
(iv) Sensory quality;
(v) Packaging;
(vi) Price;
(vii) Advertisement.

A combination of these factors, which may vary from person to person and from area to area determines consumers' preference for a product.

General attitudes to fish

General fish avoidance for religious reasons plays some part in modern affluent societies. Another factor determining the general attitude towards fish is unfamiliarity with the product. Customers from regions where fish is not usually used have not had the opportunity to develop a taste for fish. When migrating to areas where fish is regularly used these people may need time, demonstrations, information and nutritional education to get used to eating fish. Young children usually become easily accustomed to a new food.

Those who have grown up in modern cities, especially young people, are often greatly independent of social restrictions and family ties. They choose what they want to eat, are used to a wide range of products offered by industry and trade. They like to taste new foods and are little bothered by old beliefs.

In modern affluent societies, as in other societies, old and new customs and habits overlap and need attention. Money determines affluence but tradition lingers on. Therefore, the relative significance of factors rooted in tradition and those reflecting a modern way of life influences food choice and the consumers readiness to change. There may be great differences within a group of consumers, such as age and sex, etc.

Availability

Availability means that the affluent consumers can buy the food regularly in the shop or supermarket, preferably not far away from home. The food is required in a form which is easily carried. Regularity of supply is a particularly important aspect for customers who are accustomed to eat fish on certain days.

For most town dwellers the natural environment has lost its primary importance as the principle source of food. Unfortunately, the housewife may associate the environment with unsafe food as a consequence of pollution in marine and terrestrial environments.

Product form and presentation

King (1979) mentions that presentation can be a very potent factor in selecting and buying branded processed products, although compared with economic and physiological factors it may have a relatively limited influence on basic food choice. He gives fish fingers as a successful example of presentation of a product to the consumer.

Improved preservation and processing techniques led to a change in taste. Lightly salted, dried and slightly smoked fish products can now be stored over long periods of time and industry can produce such products with a mild flavour and convenient to handle. It seems that lightly cured fish products are readily and increasingly accepted by many people in different countries, a trend which may lead to increased consumption of fish. The availability of fresh fish due to refrigeration is probably responsible for the greatest increase in fish consumption in recent times. Cured fish products and delicacies are usually consumed at certain meals, not at the main meal.

Sensory quality (palatability)

Sensory quality of food (taste, smell, texture, appearance) is an important factor influencing the consumer's choice of food. Taste generally appears more important than texture but not in all cases.

Evaluation of foods in terms of the senses is only one step towards acceptance or rejection; other factors such as price, nutrition, health or safety of food may get more weight. There are also fluctuations in the importance of factors due to some general trends, or for personal reasons.

The Fischwirtschaftliche Marketing Institute (FIMA 1973) carried out a study on the consumption of fish in the Federal Republic of Germany. Palatability was the second most important factor (42.5%) determining acceptability. In first place 48.3% of the consumers regarded fish as a nutritive and healthy food. The third most important factor (35.6%) was positive experience during childhood.

Packaging

Hygiene and convenience are two significant aspects influencing the food choice of modern consumers. Packaging can increase acceptability since it can give the appearance of hygienic and appetizing food which is clean and easy to handle. There are packaging materials for all kinds of foods. Although packaged foods are more expensive, even consumers with lower purchasing power prefer to buy packaged foods, including fish products.

Packaging also contributes to extending the keeping time of perishable products, for example, frozen fish during cold storage.

Price and income

Affluent consumers have the money to buy the food they want. However, during periods of change, both when the consumer is on his way to affluence and when prices rise or income decreases, the consumer has to cut down on his expenses, including that for food. Yoshida (1981) points out that when with increasing income expenditures for food increases the consumer buys food of better qualify. With increasing affluence in Japan, for example, the small dried sardines "iriko" were replaced by shaved, dried bonito packed in plastic film. Job uncertainty makes the consumer cautious in spending and he returns to less expensive items as he cannot sustain his previous purchasing level for sophisticated products (Angehrn, 1981). Usually the consumer buys less expensive qualities of familiar food items before changing to other food items. There is an unfortunate lack of data on the price of fish and fish products as determinants of their inclusion in the diet and on the cultural and social environment of the consumer.

Advertisement

The influence on the consumer of advertising in newspapers, radio and television is well known.

Another point is the use of radio and television to promote food and fish consumption. Guggenheim and Kaufman (1976) argue that education of the children plays an important part. Miller (1977) suggests a commercial approach, also in schools, not as educational

programmes but in the form of a traditional advertising campaign. The governmental supported fish promotion campaign in Mexico, aiming at improving the nutritional status of adults and children, uses radio and television commercials made up of short, catchy phrases and melodies which are easy to remember (verbal communication).

V. CONCLUSIONS

The attitude of a consumer towards fish is complex because there are a number of determining factors and because these factors have a different significance in the decision making process of different consumers. Some of these factors have been described briefly. They originated at different times, in societies with different cultural background and for different reasons. These factors combine to influence consumer's attitudes, dietary patterns and food habits, depending on ethnic background and other social circumstances. In some cases acceptability of fish will be more determined by the adoption of a modern way of life and, in others, by traditional prejudices. Affluent consumers are also influenced by tradition and poor town's people and rural people from developing regions have acquired some ideas of modern consumers about food. This connection between attitudes towards food and eating habits on the one side and social level or way of life on the other side is one point of importance in introducing fish and estimating consumer's attitudes.

The consumer's familiarity with fish influences acceptability and the way in which fish would best be introduced. People familiar with fish have usually an idea of what they want and they may, perhaps, be more selective.

One way to introduce fish is to decide on the type of product which should be introduced and to record the likes and dislikes of the consumer. The other way is to first interview people in order to get their opinion on the form in which they would accept fish and what would be the reasons for the acceptance of this form. In the former case the product is in the middle of the campaign, in the latter case, the consumer. This appears to be the more preferable way and should in any case be chosen when large scale product development is planned.

In societies with strong family and social ties, the rules of the society are by far more important than individual likes or dislikes which is important when interviews with individuals, perhaps in camps, are made with regard to the acceptance of fish by whole population groups living a traditional way of life.

This study has tried to collect information and to draw attention to the interrelationship between culture, society and food. It is recognized that there is a dearth of information regarding fish and that most of what is available is scattered in literature of subjects other than fisheries.

On the other hand reliable data on the acceptance of fishery products and on the readiness of people to change their present attitudes is required for marketing and promotion of fish. Considering the use of underutilized fishery resources without having data indicating the likely potential capacity for fish consumption will easily lead to incorrect assumptions. Per caput consumption figures do not reflect this as there are many factors not incorporated in these figures.

Obtaining reliable data on consumer's attitudes towards fish as food and on their actual acceptance in defined areas is required. Efforts to compile these data should include field studies specifically designed for this purpose.

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APPENDIX 4

Indices of acceptability

The object of this project[1/] is to determine the acceptability of Roller-Dried Fish and Fish Protein Concentrate incorporated in popular Thai dishes. Hence the term 'acceptability' needs to be defined. Conventionally, something is termed 'acceptable' if it is considered satisfactory in the sense that it meets the minimum requirements. In the case of food, 'acceptable' means (merely) edible or fair. While this conventional meaning is useful as the lower bound of the set of 'all acceptable elements' it gives no indication of the intensity of preference among these elements: it groups the exceptionally good with the merely tolerable. Similarly the term 'unacceptable' lumps together all unsatisfactory elements regardless of intensity of dislike.

A second problem with the conventional 'acceptability' is that no indication is given as to whether something is acceptable in an absolute or a relative sense in a physical or an economic sense. It is known, however, that things which are acceptable when considered individually may be unacceptable when compared to superior alternatives. Moreover, an object whose physical properties are acceptable may be unacceptable on economic grounds (too expensive relative to its worth to the consumer).

In order to incorporate the intensity of preference in an operational concept, an index of acceptability was constructed. If the particular dish or product is exceptionally liked, it is given the value 1.00 (or 100%), while, if it is exceptionally disliked, it is given the value 0.00 (or 0%). In the middle there is the conventional meaning of acceptability 0.50 (or 50%), i.e., the preparation is edible or fair. In mid-distance between 0.50 and 1.00 we may insert a value which is "much liked" but not exceptional: 0.75 (or 75%); similarly, between 0.00 and 0.50 we may insert a value which is unacceptable but not "hated": 0.25 (or 25%). This index may be pictured graphically as follows:

Not at all	Not much	Fair	Much	Very much
0.00	0.25	0.50	0.75	1.00

The degree of like or dislike of a given item by a single individual is only one aspect ofthe intensity of preference. The other aspect is the percentage from a given sample that have a particular preference: the higher this percentage, the higher the intensity of preference or dislike. The most popular item is the one which is liked 'very much' by '100 percent' of the sample, while the least popular is the one which is 'not at all' liked by '100 percent' of the sample. Thus, in order to obtain a complete index of acceptability, the intensity of individual preference is weighed (multiplied) by the percentage of the sample having each preference and summed up over all preferences:

$$A = \sum_{i=1}^{5} x_i \frac{n_i}{N} \quad \text{or} \quad A = \frac{\sum_{i=1}^{5} x_i q_i}{100} \qquad \text{for } i = 1, 2, \ldots, 5 \quad (3.2)$$

where: A is the (complete index of acceptability (henceforth index);

x_i is the intensity of (individual) preference taking discrete values 0.00, 0.25, 0.50, 0.75 and 1.00 corresponding to 'not at all', 'not much', 'fair', 'much' and 'very much', respectively;

n_i is the number of persons having intensity of preference x_i;

N is the total sample; and, $q_i = n_i/N$ is the percentage of the sample having intensity of preference, x_i.

1/ Phithakpol, B., S. Sringam, M. Sarikaputi and T. Panayotou, Report on the acceptability testing of fish protein concentrate Type B, and roller-dried fish in Thailand. 1981 Mimeo, Kasetsart Univ., pp. 23-31

The highest value that index A can obtain is 1.00, which indicates that the item concerned is 'liked very much by everyone'; the lowest value is 0.00, which means it is 'disliked intensively by everyone'. The mid-distance, 0.50, between the lowest and highest value is still the borderline between the acceptable and the unacceptable; it indicates that the item concerned is considered 'fair'. A value of 0.50 may result from 100 percent 'fair', or from 50 percent 'very much' and 50 percent 'not at all' or from 50 percent 'much' and 50 percent 'not much'; other combinations, such as 50 percent 'much', 25 percent 'fair' and 25 percent 'not at all' also result in an index of 0.50. Note that while x_i is a discrete variable, index A is continuous and can take any number between 0.00 and 1.00. A value of 0.625, for instance, is possible and may be interpreted as indicating that the item concerned is considered better than 'fair' but yet it is not among the items liked 'much'.

Index A is an index of absolute acceptability in the sense that the item concerned is judged individually without reference to its merits or demerits by comparison to other items. It simply tells us that item X is liked very much or item Y is not liked at all. However, the introduction of new fish products is done in a background of traditional fish products against which the merits of the new products are assessed. To meet this need for evaluating one item against another the index of relative acceptability is introduced and defined as:

$$R_{jk} = \frac{A_j}{A_k} \qquad (3.3)$$

where: R_{jk} is the index of relative acceptability of item j with respect to item k;

A_j is the index of absolute acceptability of item j, and

A_k is the index of absolute acceptability of item k.

Index R has the desirable property that when j = k, R_{jk} (which now becomes R_{jj}) = 1, i.e., the relative acceptability of a product with respect to itself is one. Similarly, if two products are equally liked, R_{jk} takes the value of one. A value of R_{jk} greater than one means that product j is liked more than product k; if, on the other hand, R_{jk} is less than one, the reverse is true. A value of 0.50 may be interpreted as 'product j is liked half as much as product k'. A value approaching zero means item j is not at all liked by comparison to item k, and so on.

Indexes A and R are both indexes of physical acceptability. They indicate the degree to which some aspect (partial index) or all aspects (total index) of an item is liked either by itself or by comparison to some other item, regardless of relative prices. However, a major advantage of the new fish products is that they cost less than the traditionalproducts. There is also a price differential between the two new products with FPC costing approximately half as much as RDF. Generally speaking the lower the price the higher the degree of acceptability (within limits). First, we would like to know what percentage of the sample will choose a new preparation over a traditional one if the two preparations or products bear the same price; some respondents might be indifferent between the two items which is also to the credit of the new product because of its 'newness' and its lower production cost. In general, the percentage of the sample which prefers a given item over another (or is indifferent between the two) at a given set of relative prices may be used as an index of economic acceptability:

$$E_j = \frac{n_j}{N} \quad (P_j = \alpha P_k) \qquad \text{or} \qquad E'_j = \frac{n_j + n_{jk}}{N} \quad (P_j = \alpha P_k) \qquad (3.4)$$

where: E_j is the index of economic acceptability of product j; E'_j is a modified index of economic acceptability counting indifference between two items as preference for the new item

n_j is the number of respondents prefering item j over item k;

n_{jk} is the number of respondents who are indifferent between item j and item k;

N is the size of the sample;

P_j is the price of item j;

P_k is the price of item k; and,

α is a constant equal to the ratio P_j/P_k.

Secondly, we would like to know the price responsiveness of the preference for each item. For example if the price of a new product is reduced by 25%, i.e. it is only 75% of the price of the traditional product, would the index of (economic) acceptability change and by how much? Based on the law of demand, which states that demand varies inversely with the price, we would expect acceptability to increase with the reduction of the price. The magnitude of the increase, however, differs from one case to another depending on tastes and habits, availability of close substitutes, the level of the price and the magnitude of the price change. The price elasticity of acceptability (a concept akin to the price elasticity of demand) gives the percentage rate of change in the (economic) acceptability of a product as a result of a 1% change in its price, i.e.

$$\varepsilon_j = \frac{\text{\% change in acceptability}}{\text{\% change in price}} = \frac{\Delta E_j}{\Delta P_j} \cdot \frac{P_j}{E_j} \qquad (3.5)$$

Where: ε is the price elasticity of acceptability of item j;

E_j is the index of economic acceptability of item j;

P_j is the price of item j before the change;

ΔP_j is the magnitude of the price change; and

ΔE_j is the (consequent) change in the magnitude of E_j. For instance, if at $P_j = 10$ $E_j = 50$ while at $P_j = 8$ $E_j = 60$ (i.e. $\Delta P_j = -2$ causes a $\Delta E_j = 10$) the elasticity of acceptability is equal to -1.00.

All concepts of acceptability defined above were based on explicit statements by the respondents who tasted and compared the various food preparations presented to them. However, something can also be learned by studying the observed behaviour of the respondents. As these food preparations were served in lieu of lunch, large quantity of leftovers may indicate unacceptability while no leftovers at all may indicate the reverse. As mentioned earlier, the amount of leftovers from each preparation by each respondent was estimated and recorded. To construct an index of revealed acceptability we use exactly the same method we did for the absolute physical acceptability (see formulas (3.1) and (3.2) above) except that we used the amount of leftovers by each respondent instead of the intensity of individual preference. Leftovers of between zero and one-fifth of the serving were considered equivalent to liking the dish 'very much' and were assigned the value 1.00, while leftovers of one-half of the serving were considered equivalent to 'fair' and so forth as shown graphically below:

Not at all	Not much	Fair	Much	Very much
0.00	0.25	0.50	0.75	1.00
$\ell > \frac{3}{4}$	$\frac{3}{4} \ell \geq \frac{1}{2}$	$\ell = \frac{1}{2}$	$\frac{1}{2} > \ell > \frac{1}{5}$	$\ell < \frac{1}{5}$

where 'ℓ' stands for leftovers. (3.6)

Then, the index of revealed acceptability V_j is given by the index of leftovers weighed (multiplied) by the percentage of the sample for which the particular amount of leftovers was observed and summed up:

$$V_j = \sum_{i=1}^{5} \frac{z_i \, n_i}{N} \quad \text{for } i = 1, 2, \ldots, 5 \qquad (3.7)$$

where z_i is the index of leftovers taking the values 0.00, 0.25, 0.50, 0.75 and 1.00 as indicated in formula (3.6) above;

n_i is the number of the respondents corresponding to z_i, and

N is the sample size.

There is, however, one serious problem with using leftovers as indicators of acceptability. Some respondents may have left a large quantity of leftovers not because they disliked the particular preparation but simply because they were not hungry; similarly, other respondents may have left few leftovers not because of intensive preference but because of intensive hunger at the moment. It is, thus more meaningful to use a relative index of revealed acceptability obtained in a manner analogous with index (3.3) above:

$$W_{jk} = \frac{V_j}{V_k} \qquad (3.8)$$

where W_{ij} is the relative index of revealed acceptability of preparation j with respect to preparation k; and,

V_j and V_k are absolute indexes for preparations j and k respectively defined by equation (3.7) above.

This last index assigns importance not to the absolute amount of the leftover but on its relative magnitude in comparison to the alternative with which it is compared. Even with more than half of the serving being leftover a new preparation may still be acceptable if more was left over from the traditional preparation.

To sum up, the following concepts of acceptability have been introduced and defined:

(1) absolute physical acceptability: indicates the expressed intensity of like or dislike, by the sample as a whole, of the physical properties of a given item regardless of its price or of the presence of alternatives;

(2) relative physical acceptability: indicates the relative intensity of preference, by the sample as a whole, between two alternatives regardless of their relative prices;

(3) economic acceptability: indicates the intensity of preference, by the sample as a whole, between two items given their relative prices; congenial to this concept is the elasticity of acceptability which indicates the degree of responsiveness of economic acceptability to price changes;

(4) revealed acceptability: in its absolute form it indicates the amount of leftovers from a given item by the sample as whole; in its relative form it indicated the relative preference for the two items as revealed in the relative amounts of leftovers.

These concepts were made operational by construction indexes, which enable both cardinal and ordinal rankings of the food preparations, the recipes and the fish products. However, it should not be expected that these indexes would give identical results. Each concept is based on a different premise than the rest and is intended to convey a different type of information: concept (1) ignores the existence of alternatives and the role

of prices; concept (2) brings in alternatives but still it ignores prices; concept (3) brings in alternatives and their relative prices; concept (4) is analogous to concepts (1) and (3) but not as exact though it has the advantage of being based on actual behaviour. Of course, the more indexes rank a given product at the same position the more confident we become as to the degree of its acceptability or unacceptability. Irreconcilable conflicts between the various indexes (concepts) may be a sign of weak acceptability. However, some precedence ought to be given to the indexes of taste and economic acceptability.

As mentioned earlier, after the completion of the testing of the recipes for each new product vis-a-vis its traditional counterpart the respondents were asked to make an overall assessment and suggest a fair price for each product as well as indicate the intended type and frequency of use. This gave yet another opportunity for ranking the various recipes, which may or may not agree with the results obtained during the test. In testing the various recipes the respondents based their preferences on their own tastes alone while, when they were asked how they would use the product at home, they probably took into account their family's tastes as well.

In addition to the indirect comparison which is possible between the two new products based on their performance vis-a-vis their traditional counterparts, a direct comparison between RDF and FPC was also made using the same concepts of acceptability described above, and substituting RDF for the traditional product.

The regression equation

In order to investigate the relationship between the respondent's socio-economic background and their preferences between the new and traditional products, the following procedure was employed. First, a random sub-sample of 50 respondents from each sample was drawn and stratified into groups according to the demographic structure, the eating habits, and the economic conditions of the respondents; then, the various indexes of acceptability for these groups were calculated and compared. As significant differences between groups were observed an attempt was made to determine what percentage of the variation in the index of acceptability among the respondents could be explained by socio-economic variables and which of these variables were statistically the most significant. To do this, the following function was specified expressing an individual's intensity of preference or acceptability of a new product as a function of : (i) his acceptability of the tested preparations in their traditional form; (ii) his income or expenditure on various items, including fish; (iii) the price responsiveness of the respondent's demand for fish; (iv) his eating habits; and, (v) his demographic characteristics, i.e.

$$X_j = f(X_k\ Y, P, T, D) \qquad (3.9)$$

where X_j is the respondent's intensity of preference for product j (new) obtained as $\sum_{m=1}^{4} x_{mj}$ where x_{mj} is his intensity of preference for the individual preparations in which product j was incorporated;

X_k is the respondent's intensity of preference for product k (traditional) obtained in a manner analogous to X_j ;

Y is a factor of income or expenditure-related variables;

P is a dummy (0 , 1) variable indicating the price responsiveness of the individual's demand for fish;

T is a set of dummy variables representing tastes and eating habits; and,

D is a factor of demographic dummy variables, such as sex, age, marital status, residence, origin and location and type of work.

Function (3.9) was, then, specified as a linear regression equation with an error term, ε_j :

$$Y_j = \alpha_o + \alpha_1 X_k + \beta_1 Y_1 + \beta_2 Y_2 + \ldots + \gamma P + \delta_1 T_1 + \delta_2 T_2 + \ldots + \theta_1 D_1 + \theta_2 D_2 + \ldots + \varepsilon_j \quad (3.10)$$

where $\alpha_o, \alpha_1, \beta_1, \beta_2, \ldots \gamma, \delta_1, \delta_2, \ldots, \theta_1, \theta_2, \ldots$ are parameters to be estimated. Equation (3.9) was estimated using stepwise linear regression techniques. Based on the t-ratios (i.e. the size of the parameters relative to the size of the corresponding standard errors), the statistical significance of the explanatory variables was determined. The overall significance of the model was judged on the basis of the R^2 statistic, that is, the proportion of variation in the dependent variable (acceptability) explained by the independent or explanatory variables.

APPENDIX 5

Fish acceptability Test II

Date: 8 November 1981 Interviewer:

		Yes	No	Indif-ferent	No Answer
1.	Do you like the taste of the served fish dishes?	86% (170)	14% (27)		
2.	Do you like the smell of the served fish dishes?	85% (168)	15% (29)		
3.	Do you like the colour of the served fish dishes?	85% (167)	15% (29)		(1)
4.	Would you like to eat fish again?	86% (169)	14% (28)		

		Once/ week	Once/ month	Never	No Answer
5.	How often would you like to eat fish?	76% (149)	13% (26)	11% (22)	

		Yes	No	No Answer
6.	Do you know how to prepare and cook fish after the instruction you got in the course?	83% (164)	16% (31)	1% (2)
7.	Would you like to cook fish for your family?	87% (172)	13% (25)	
8.	Do you like fish better now than you did before the fish tests and cooking demonstrations?	86% (169)	14% (27)	
9.	Would you recommend fish for your relatives and friends?	90% (177)	10% (20)	

Sample: 197 refugee women at the Women's Education Service

Larsson, K., 1981 Fish acceptability tests among refugee women in Somalia. Mimeo, GCP/INT/325 (NOR), Rome, 15 p.

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